PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Jiang, et al.	**Art Unit:**	1775
Serial No.:	10/711,154	**Examiner:**	Timothy M Speer
Filed:	08/27/2004		
Docket No.:	A382-USA		
For:	Material and Method to Prevent Low Temperature Degradation of Zirconia in Biomedical Implants		

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PO Box 1450
Alexandria, VA 22313-1450

APPLICANT'S REPLY TO EXAMINER'S ANSWER

This Reply is in furtherance of the Notice of Appeal filed in this case on June 08, 2006 and responds to the Examiner's Answer mailed 11/17/2006.

APPLICANTS' REPLY

Lest the proverbial "forest be lost due to the trees" Applicant will briefly state the trivial issue that is preventing the Examiner from allowing this patent application.

Schubert Teaching

Schubert is an ineptly written technical publication that is not only uninterpretable but that absolutely does not render obvious Applicant's invention, even when combined with Hida. Arguably, Schubert does not even teach how to convert the surface of an Y_2O_3-containing tetragonal zirconia polycrystal [Y-TZP] into the stable tetragonal phase. No one skilled in the art of ceramic processing could or would find that Schubert teaches a coating technique.

The Schubert abstract suggests that the surface of the ceramic is converted

by sintering green [60% dense] Y-TZP in a powder bed of Y_2O_3, CeO_2, CaO and MgO. Then the PSZ-Type surface layer containing tetragonal precipitates is formed on ageing. [see Abstract]

However, attempts by Applicant to discern the Schubert teaching for surface modification/conversion are futile. Schubert teaches that a green ZrO_2 powder compact that is prealloyed with Y_2O_3 is sintered at 1500°C for 2 hours. Schubert teaches that "TZP samples sintered in air (uncoated) and in the stabilizing powder bed (coated)" [Schubert at p158, first para.] and that they are then annealed at 250°C in air or in vacuum for 720 hours [i.e., for 30 days].

Schubert teaches that sintering in an Y_2O_3 powder results in a 5um fully cubic layer. He teaches that similar fully or partially stabilized layers are formed by sintering in other stabilizing oxides. One can only assume that all of these surface conversions occur at the stated calcine temperature of 1500°C for 2 hours. [Schubert at p158 first para] "He teaches that the thickness of the layer depends on the quality of the interface between powder and green compact and on the diffusion rate of the stabilizing oxide into the TXP Material." [Schubert p158, last para.] The meaning of the phrase "the quality of the interface" is not taught.

The problem is that Schubert also teaches that surface conversion occurs when the sample is "annealed in CaO powder." He teaches that "[t]he cubic layer on samples annealed in MgO could be formed into a PSZ-type coating on annealing at 1350°C for 5 h in air." [Schubert p 160, 1 para.] In the next paragraph Schubert teaches that "[u]ncoated Y-TZP samples showed 69% monoclinic content and cracks (FIG.3) near the surface after annealing for 720 h in air. The monoclinic fraction increases with time, i.e. the **transformed surface layer** does not act in a passivating manner." [Schubert p160, 1st full para.] [emphasis added]

Applicant has made assumptions about how Schubert teaches that the surface is converted to a tetragonal phase. The teaching is vague and inconsistent. However, Schubert does not teach a coating technique. Despite the fact that Schubert uses the term "coated" and "coating" he does not refer consistently to a coating and does not teach a technique that could possibly form a

coating. Schubert clearly teaches a "surface transformation" [page 160, 1st full para.] and a surface transformation that is dependent "on the diffusion rate of the stabilizing oxide into the TXP material." [p158, last para.] One skilled in the art of ceramic processing does not recognize that a "coating", which is unambiguously defined as a "coat or layer over a surface," can be formed by a surface diffusion technique. [Webster's New World Dictionary, 4th Ed., Wiley 2004.]

Overall, Hida teaches a completely unrelated technology for SIALONs as an additive to aid in sintering zirconia. Alumina is well know by one skilled in the art of ceramic processing as not to be an additive that produces tetragonal phase zirconia as an additive, while magnesia, calcia, yttria, ceria do enable tetragonal phase formation. [Zirconia toughened alumina [ZTA] exists, but that is not relevant to these discussions just as alumina toughened zirconia exists.]

How combining such disparate teachings could render Applicant's invention obvious is inexplicable. Applicant explains his attack of Schubert and Hida separately and in combination by stating that neither citation teaches Applicant's invention and could not do so.

Applicant Teaching

Applicant teaches a fully dense yttria-stabilized tetragonal zirconia polycrystal substrate that is coated with alumina [Al2O3] that is ion beam assisted deposited [IBAD] on the surface.

Ion Beam Assisted Deposition [IBAD] is Known to Produce Unique Properties

Those skilled in the art would recognize that IBAD produces materials having unique properties. Applicant points to these properties at Application paragraphs 17, 21, 25, and 26, for example. The Examiner finds that Applicant's claimed alumina coating product is the same as that of the prior art. A successfully applied IBAD coating has the benefit of being a conformal, dense, low porosity, and an adherent covalent oxide, in the case of alumina. It is therefore resistant to moisture penetration and protects zirconia from the well-known low-temperature degradation problem.

Given that no one can point to a similar alumina material, including

Schubert, Hida, the Examiner, and Applicant, it seems preposterous to make patentability determinate on the presentation of a specific process comparison where there are no known data or other measurable indicia by which to compare ion beam assisted deposition with other methods. Applicant makes it clear that not only has his alumina-coating invention not been previously taught or rendered obvious, but that the IBAD alumina-coating is unique. A table of results would show that any other selected alumina coating technique did not protect the underlying zirconia substrate from low-temperature degradation. Applicant is not aware of other candidate coating techniques for alumina, so presenting data for such unknown processes is not possible, as is know to those skilled in the art.

Examiner's Objection to Appellant Assertiion

The Examiner's objection to Applicant's claim [Appeal Brief at page 8, first paragraph) that "[c]onsidering Schubert and Hida in combination does not **anticipate** Applicant's invention and therefore claims 1 and 13 are allowable and claims 2-4 and 14 are allowable as further limitations on allowable independent claims" [emphasis added] is noted and Appellant requests that the Board substitute "render obvious" for "anticipate."

Respectfully submitted,

/Gary Schnittgrund/

Date

Gary Schnittgrund
Attorney for Appellant
Reg. No. 42,130

The Alfred E. Mann Foundation for Scientific Research
PO Box 905
Santa Clarita, California 91380-9005
(661) 702-6814
(661) 702-6710 (fax)

Customer No.: 24677